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CHECKLIST

New data regarding the distribution and status of the herpetofauna from urban and peri-urban habitats in the city of Pitești, Argeș county (Romania)

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Abstract

Identifying urban and peri-urban areas inhabited by species of reptiles and amphibians represents the first step in understanding how herpetofauna can adapt to anthropogenic factors. This is particularly true for regions where sampling biases have left significant gaps in our knowledge of fauna distribution, such as Romania. The aim of the study is to show my preliminary observations on the herpetofauna and its use of habitats in the urban and peri-urban environments from the city of Pitești, Argeș County, located in southern Romania. I identified nine species of amphibians (*Salamandra salamandra, Lissotriton vulgaris, Triturus cristatus, Bombina variegata, Bufo bufo, Bufotes viridis, Hyla orientalis, Pelophylax ridibundus* and *Rana dalmatina*) and nine species of reptiles (*Emys orbicularis, Trachemys scripta, Lacerta agilis, Lacerta viridis, Podarcis muralis, Anguis colchica, Coronella austriaca, Natrix natrix* and *Natrix tessellata).* The most abundent species in urban environments were *Podarcis muralis* and *Bufotes viridis,* with other species naturally present in the same habitats being *Lacerta viridis, Hyla orientalis* and *Bufo bufo.* In an artificial urban pond there were present *Emys orbicularis* and the invasive species *Trachemys scripta* (together with other exotic turtles belonging to other genera) as a result of translocation and releases. When taking into account the peri-urban areas as well, the most abundant species in the study area were *Bombina variegata, Rana dalmatina* and *Bufotes viridis,* the first two being limited to the woodland area. The most widespread species were *Hyla orientalis, Bufotes viridis, Lacerta viridis, Podarcis muralis* and *Natrix natrix.* These widespread species were present throughout all the study area. I have also recorded some species of reptiles with very few observations in the Argeș County: *Natrix tessellata* and *Trachemys scripta.* Finally, I identified anthropogenic factors that negatively impact the herpetofauna, such as habitat loss, direct persecution, road mortality, invasive species and poaching.

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Keywords
herpetofauna, urban and peri-urban environments, urbanization, reptiles, amphibians, Argeș.

Introduction

Reptiles and amphibians comprise the two vertebrate groups currently most vulnerable and under global population decline (Gibbons et al. 2000; Stuart et al. 2004). These groups exhibit many intrinsic characteristics that increase their proneness to extinction, and lots of anthropogenic threats affect them, such as habitat loss (Mayani-Parás et al. 2019), climate change (Bickford et al. 2010), invasive species, new diseases spread by humans, poaching and direct persecution as a result of public fear, myths or misbeliefs (Fuhn 1969; Marshall et al. 2020). Furthermore, many species of wildlife that live in urban environments and densely populated areas, so it is important to document them and ensure the best preservation of the biodiversity possible, urbanization being part of the habitat loss phenomenon (Hamer and McDonnell 2010; Farinha-Marques et al. 2011). Although urbanization contributes greatly to habitat loss, some species of reptiles and amphibians, including some threatened and protected, are known to occur within urbanized environments (Delaney 2021). Therefore, it is important to explore how the herpetofauna is utilizing the urban enviroments and habitats, how certain anthropic activities affect it and what measures of urban habitat management should be taken to ensure the preservation of these populations. The Argeș county, situated in Southern Romania is very poor in data regarding the species of reptiles and amphibians, due to the lack of studies conducted, most of the articles on the herpetofauna being focused on the area of the montane regions in the North of the county (Fuhn 1960; Fuhn and Vancea 1961; Strugariu et al. 2009; Covaciu-Marcov et al. 2010, 2014; Iftime and Iftime 2014), but none in the central area where Pitești is located. This study brings a needed series of data missing from our knowladge on the Romanian fauna, as well as shedding more light on the effects urbanization and expansion of human-inhabited areas have on the local populations of reptiles and amphibians. This work represents the first inventory and mapping survey of the herpetofauna of the urban and peri-urban environments (with some notes regarding natural habitats) of the city of Pitești (Argeș county), Southern Romania. My study represents a necessary first step for future management and conservation efforts of the area, and a general contribution to the mapping of the Romanian herpetofauna, where sampling biases have left major gaps in knowledge and numerous uncharted areas (Cogălniceanu et al. 2013).

Material and methods

The survey was carried out in the city of Pitești and its surrounding areas. Pitești is a city in the center of Argeș County, being surrounded by the Trivale Forest and the

Argeș River, including part of the Natura 2000 site ROSPA0062 (Figure 1). The altitude varies between 250 m and 400 m. I conducted field surveys between 2018 and 2021, mostly by making repeated visits to certain locations that presented favourable habitats for reptiles and amphibians (Edgar et al. 2010; Török et al. 2013) and using visual and auditory transects and active searches for animals (Török et al. 2013). However, I also considered old records, occasional observations from locals and biologists, as well as data from the collections of the Argeș County Museum and the University of Pitești. I visually identified animals without capture as often as possible. Only such specimens that needed rescue/rehabilitation were captured - see text below. I captured animals either by hand or using a net. To identify turtles basking at great distances, I used a pair of 10x42 Opticron binoculars and a Nikon D5600 camera with a 70–300 mm lens. The habitats were varied: forest, river, lake, parks, urban areas etc., and so, the searching methods were adapted accordingly. I visited the rest of the habitats mostly during spring and summer months early in the day, especially during the 07:30–12:00 interval, and looked for reptiles basking and picked up logs, stones, vegetation and garbage. I also identified different amphibians by their call, mostly at night in spring. The identifications were made with the aid of Speybroeck et al. 2016 and Cogălniceanu 2002.

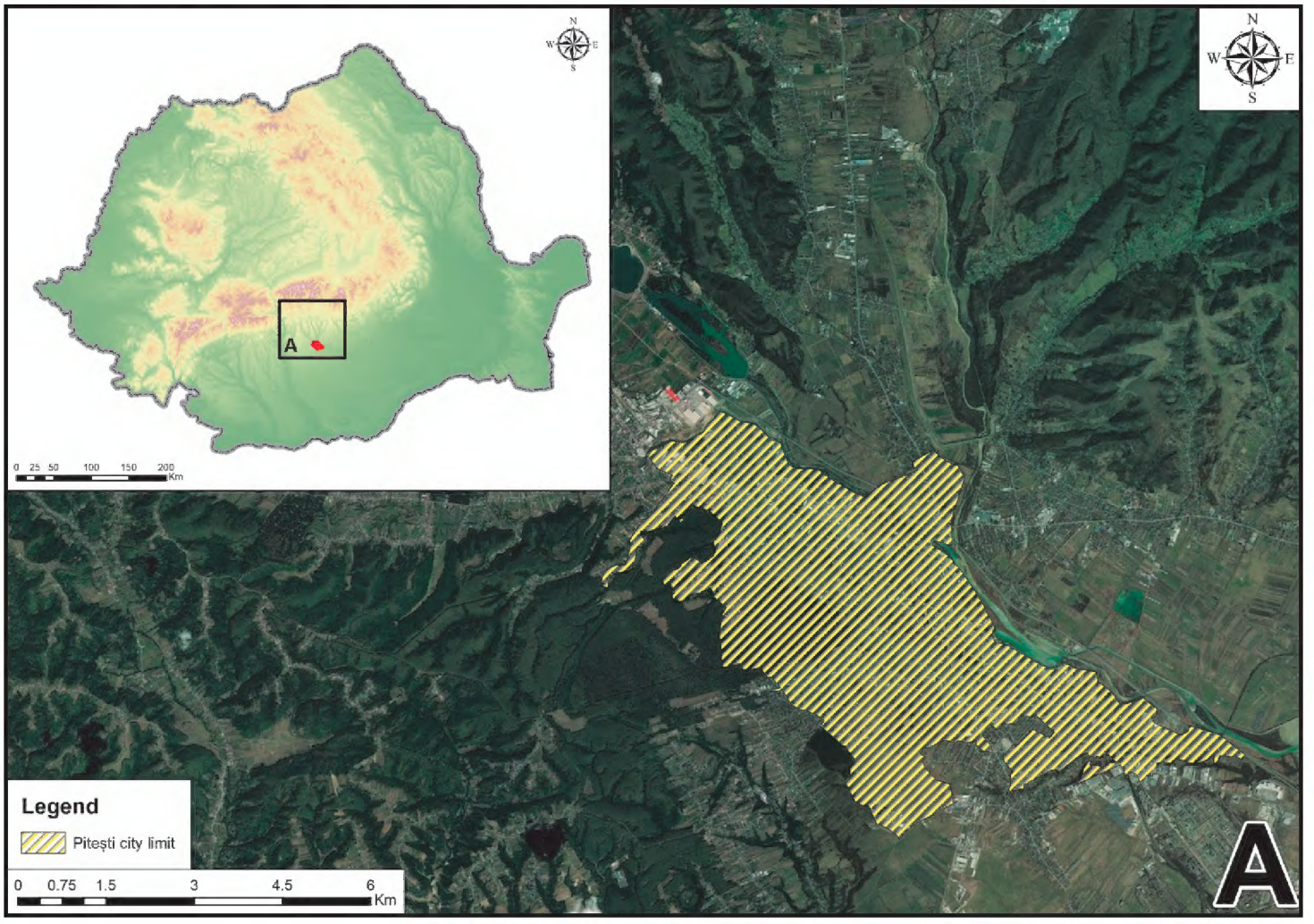

Figure 1. The study area (source: ArcGIS 10.4 basemaps).

Results and discussion

During my research I identified nine species of amphibians: *Salamandra salamandra, Lissotriton vulgaris, Triturus cristatus, Bombina variegata, Bufo bufo, Bufotes viridis, Hyla orientalis, Pelophylax ridibundus* and *Rana dalmatina*, belonging to five families (Salamandridae, Bombinatoridae, Bufonidae, Hylidae and Ranidae) and nine species of reptiles: *Emys orbicularis, Trachemys scripta, Lacerta agilis, Lacerta viridis, Podarcis muralis, Anguis colchica, Coronella austriaca, Natrix natrix* and *Natrix tessellata,* belonging to five families (Emydae, Lacertidae, Anguidae, Colubridae and Natricidae).

Peak activity was observed in September with 13 species recorded, followed May and August, with 12 species each. The monthly breakdown of the species observed is shown in the table below (Table 1). One curious and late observation was that of a *Natrix natrix* in early December 2019 (Fuciu Cătălin, pers. communication) (Table 1).

The historical records from the study area were gathered from the specimen collection of the University of Pitești and the Argeș County Museum. It is to be noted that the exact location is almost never given, and instead the label only mentions a locality or a vague, general area. For this reason, the historical observations are not represented on the maps (those only containing the sightings within the study period), instead choosing to put into a table as follows in Table 2.

Out of all the species observed, seven were found in both urban and peri-urban habitats (*Bufo bufo, Bufotes viridis, Hyla orientalis, Lacerta viridis, Podarcis muralis* and *Emys orbicularis* and the invasive species *Trachemys scripta,* the last two being present in urban environments as a result of translocation, artificial introduction and human abandonment (park administration, pers. communication)) and the rest exclusively in peri-urban habitats (Table 3). When it comes to urban areas with very few natural elements, the most abundant species were *Podarcis muralis* and *Bufotes viridis,* both found hiding in crevices in concrete and coming out to sun, for hunting, as well as mating.

The most abundant amphibian species were *Bombina variegata, Rana dalmatina* and *Bufotes viridis,* while the most abundant reptile species was *Podarcis muralis.* Despite being the most abundant, these species of amphibians were not the most widespread, *Bombina variegata* and *Rana dalmatina* being restricted to the woodland area (Figure 2). The most widespread amphibian species according to the distribution maps created are *Bufotes viridis* and *Hyla orientalis*, while the most widespread reptile species are *Podarcis muralis, Lacerta viridis* and *Natrix natrix*. These widespread species were remarkable in being present through the studied area in diverse habitats, be it even insular recordings.

Table 1. Observed presence of each species in the study area by each month.

	January	February	March	April	May	June	July	August	September	October	November	December
Salamandra salamandra			+				+		+ (U)	+		
Triturus cristatus		+(M)	+ (M)	+	+						+ (M)	
Bombina variegata				+	+		+	+	+	+		
Bufo bufo					+		+	+	+			
Bufotes viridis						+	+	+	+	+	+	
Hyla orientalis				+ (M)		+ (Băjan Eliana, pers. communication)	+	+				
Pelophylax sp.				+	+	+	+	+	+			
Rana dalmatina			+	+	+		+	+	+	+	+ (M)	
Emys orbicularis			+ (D)		+	+	+		+ (M)			
Trachemys scripta						+			+			
Lacerta agilis			+			+		+	+ (M)			
Lacerta viridis				+	+	+	+	+	+			
Podarcis muralis		+	+	+	+		+	+	+	+	+	
Anguis colchica					+	+		+	+			
Coronella austriaca					+			+	+ (M)			
Natrix natrix			+		+	+ (M)	+	+				+ (Fuciu Cătălin, pers. communication)
Natrix tessellata										+ (D)		

"+" – at least one individual of the respective species was observed at least once in the study area during the said month in the course of the study

"+(M)" -the species was not observed by the author during the said month, but there are historical specimens collected in the study area from the said month in the collection of the Argeș County Museum

"+(U)"- the species was not observed by the author during the said month, but there are historical specimens collected in the study area from the said month in the collection of the University of Pitești

"+(D)"- the species was not observed by the author personally in the study area during the said month, but the sightings were provided from public uploads on various databases and social media platforms

Table 2. The inventory of reptile and amphibian specimens in the collections of the Argeș County Museum and the University of Pitești

Institution	Species	Number of individuals	Date	Location	Collector	Notes
Argeș County Museum	*Natrix natrix*	1	June 1965	Pitești AG	Mihăilescu Gh.	adult
Argeș County Museum	*Coronella austriaca*	1	September 15 1969	Bascov AG	Marius Gh.	adult
Argeș County Museum	*Lacerta viridis*	1	June 26 1972	Trivale Forest, Pitești AG	Fusea N.	adult male
Argeș County Museum	*Natrix natrix*	1	1972	Pitești AG	?	adult
Argeș County Museum	*Anguis colchica*	1	September 24 1978	Trivale Forest, Pitești AG	Mătieș M.	adult; 380 mm
Argeș County Museum	*Lacerta viridis*	1	July 1977	Trivale Forest	Fusea N.	juvenile
Argeș County Museum	*Emys orbicularis*	2	September 1976	Ștefănești Zăvoi	Mătieș M.	adult female; adult male
Argeș County Museum	*Triturus cristatus*	1	March 20 1972	Trivale Forest, Pitești AG	Fusea N.	adult
Argeș County Museum	*Triturus cristatus*	8	November 7 1972	Trivale Forest, Pitești AG	Fusea N.	6 adult males; 2 adult females
Argeș County Museum	*Rana dalmatina*	2	November 7 1972	Trivale Forest, Pitești AG	Fusea N.	adult male; adult female
Argeș County Museum	*Triturus cristatus*	12	February 20 1973	Trivale Forest, Pitești AG	Fusea N.	8 adult males; 4 adult females
Argeș County Museum	*Hyla orientalis*	3	April 19 1973	Trivale Forest, Pitești AG	Fusea N.	adults
Argeș County Museum	*Rana dalmatina*	2	April 19 1973	Trivale Forest	Fusea N.	adult male; adult female
Argeș County Museum	*Bombina variegata*	6	April 19 1973	Trivale Forest	Fusea N.	2 females; 4 unsexed
Argeș County Museum	*Triturus cristatus*	5	April 19 1973	Trivale Forest	Fusea N.	females
Argeș County Museum	*Pelophylax ridibundus*	1	July 10 1973	Trivale Forest	Fusea N.	female

Table 2. (continued)

Institution	Species	Number of individuals	Date	Location	Collector	Notes
Argeș County Museum	*Pelophylax sp.*	?	April 4 1970	Pitești AG	Mățieș M.	spawn
Argeș County Museum	*Pelophylax ridibundus*	7	September 20 1974	Bascov Lake	Mățieș M.	unsexed adults
Argeș County Museum	*Pelophylax ridibundus*	9	September 21 1974	Lunca Goleşti	Mățieș M.	unsexed adults
Argeș County Museum	*Rana dalmatina*	1	September 20 1974	Bascov Lake	Mățieș M.	juvenile
Argeș County Museum	*Rana dalmatina*	2	1977	Trivale Forest	?	juveniles
Argeș County Museum	*Triturus cristatus*	2	April 25 1974	Pitești AG	Fusea N.	unsexed
Argeș County Museum	*Lacerta viridis*	1	July 1977	Trivale Forest	Fusea N.	unsexed
Argeș County Museum	*Pelophylax ridibundus*	1	August 1969	Pitești AG	Balmuș I.	unsexed
Argeș County Museum	*Pelophylax ridibundus*	1	May 5 2018	Goleşti AG	Enescu L.	?
University of Pitești	*Triturus cristatus*	2	May 1968	Pitești AG	Stănescu Gh.	male and female
University of Pitești	*Triturus cristatus*	1	May 1968	Pitești AG	Stănescu Gh.	female
University of Pitești	*Pelophylax esculentus*	2	May 1965	Pitești AG	Stănescu Gh.	unsexed
University of Pitești	*Rana dalmatina*	1	October 1969	Trivale Forest	Stănescu Gh.	unsexed
University of Pitești	*Bufotes viridis*	1	September 1964	Pitești AG	Stănescu Gh.	unsexed
University of Pitești	*Hyla orientalis*	1	June 1966	Trivale Forest	Stănescu Gh.	unsexed
University of Pitești	*Bufotes viridis*	1	1964	Pitești AG	Stănescu Gh.	unsexed
University of Pitești	*Salamandra salamandra*	2	September 1968	Trivale Forest	Stănescu Gh.	unsexed
University of Pitești	*Bombina variegata*	1	October 1970	Pitești AG	Stănescu Gh.	unsexed
University of Pitești	*Lacerta agilis*	1	September 1968	Pitești AG	Stănescu Gh.	Unsexed

Table 3. Use of urban and peri-urban habitats by each species

Species	Habitat
Salamandra salamandra	Peri-urban habitats
Lissotriton vulgaris	Peri-urban habitats
Triturus cristatus	Peri-urban habitats
Bombina variegata	Peri-urban habitats
Bufo bufo	Peri-urban and urban habitats
Bufotes viridis	Peri-urban and urban habitats
Hyla orientalis	Peri-urban and urban habitats
Pelophylax sp.	Peri-urban habitats
Rana dalmatina	Peri-urban habitats
Emys orbicularis	Peri-urban and urban habitats
Trachemys scripta	Peri-urban and urban habitats
Lacerta agilis	Peri-urban habitats
Lacerta viridis	Peri-urban and urban habitats
Podarcis muralis	Peri-urban and urban habitats
Anguis colchica	Peri-urban habitats
Coronella austriaca	Peri-urban habitats
Natrix natrix	Peri-urban habitats
Natrix tessellata	Peri-urban habitats

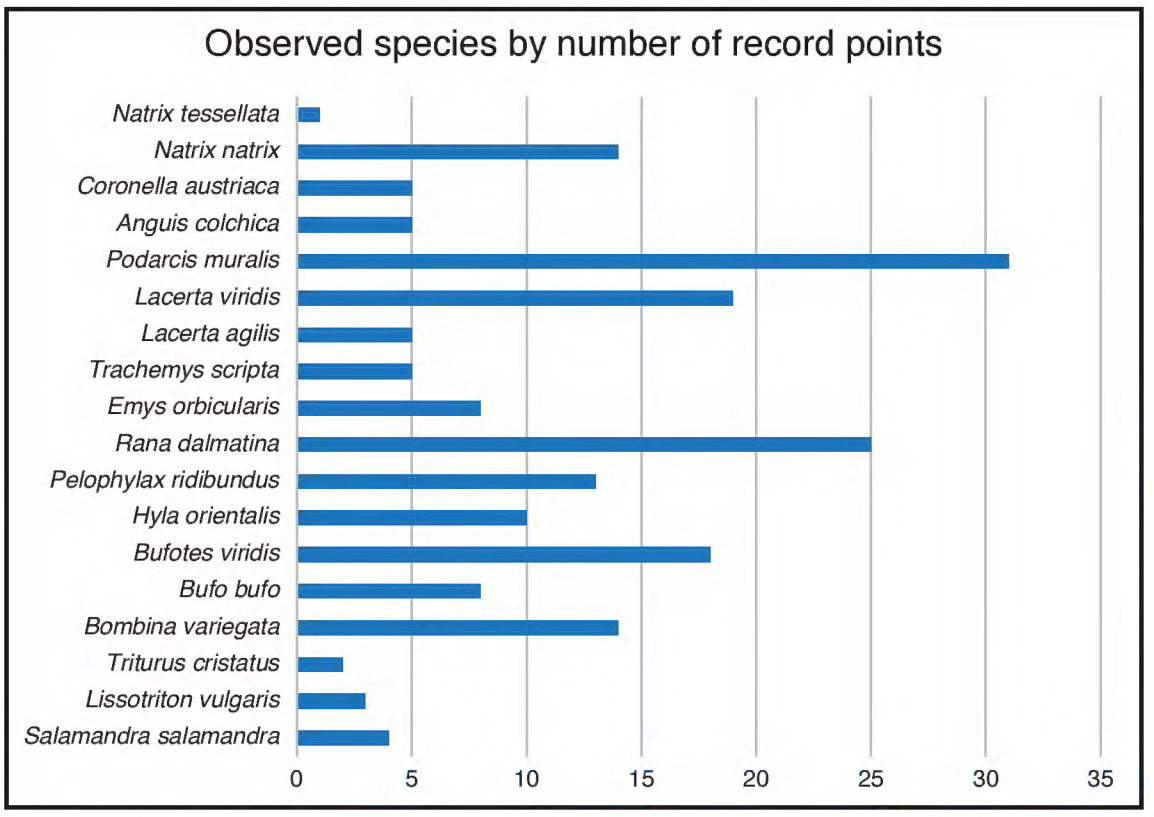

Figure 2. Observed species of reptiles and amphibians by number of record points. It should be noted that this graphic only shows the points where the species was recorded. The abundence is not always accurately represented as in some record points there have been observed dozens of individuals at a time.

Checklist

Class Amphibia
Order Urodela
Family Salamandridae
Salamandra salamandra (Linnaeus, 1758)

The fire salamander was identified as larvae in 2 locations in the Trivale Forest, and an adult photographed by a local in his garden at the edge of the said forest. The larvae were found in small ponds on the forest floor in early July 2020 and early August 2020. Another adult was recorded on October 24th 2021 dead on a trail in the same forest with the cause of death unknown, but seemingly crushed. The habitat these animals were found in is a deciduous forest, at an altitude of 320 m and 400 m. (Figure 3)

Lissotritton vulgaris (Linnaeus, 1758)

The smooth newt was found in three locations: two separate individuals in ponds at the edge of the forest with very thick vegetation as adults in the aquatic phase, one of them being a breeding male. The animals were both observed in April 2021. One more larva was observed on May 23rd 2020 in a stream. (Figure 4)

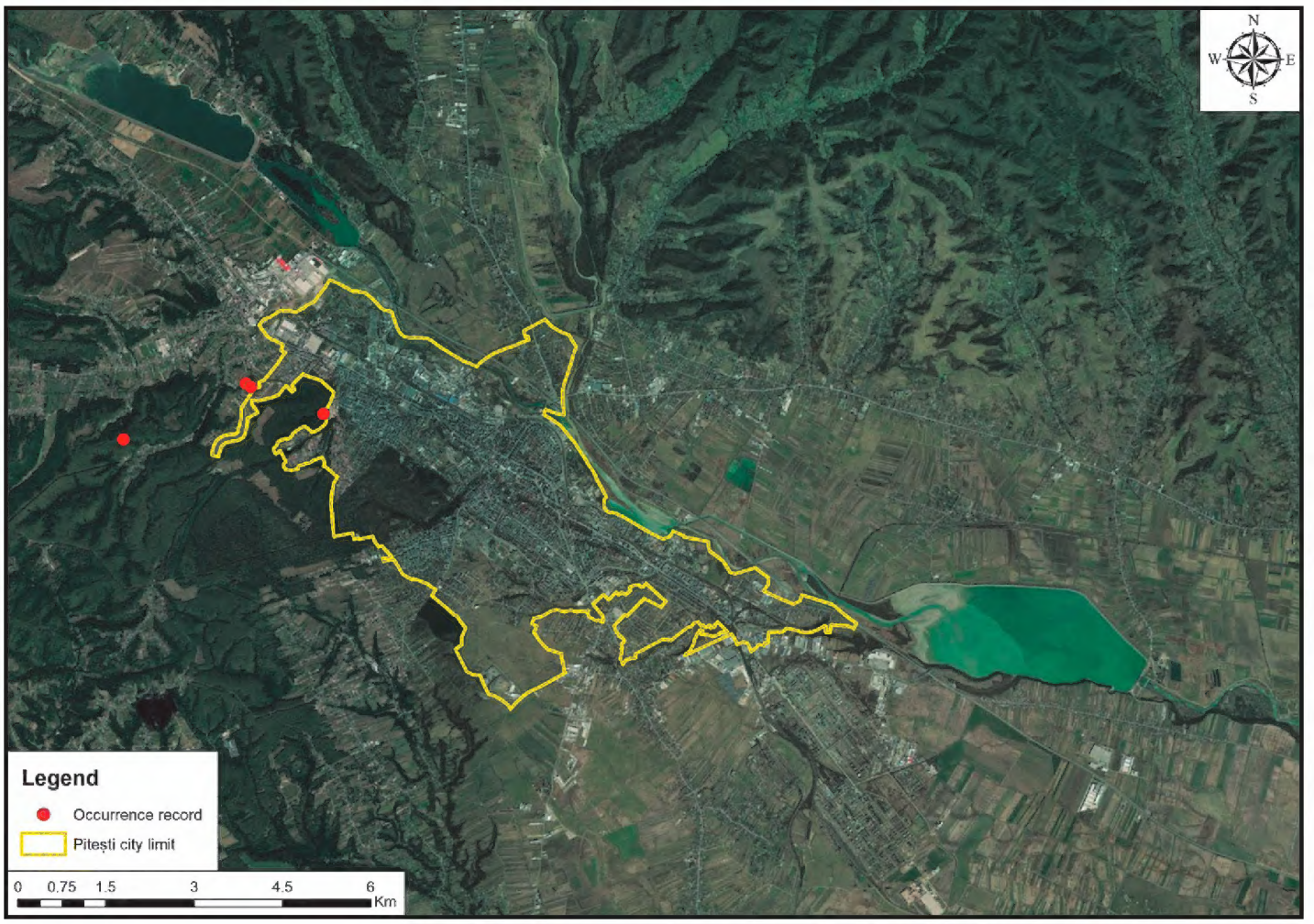

Figure 3. Distribution map of *Salamandra salamandra* in the studied area.

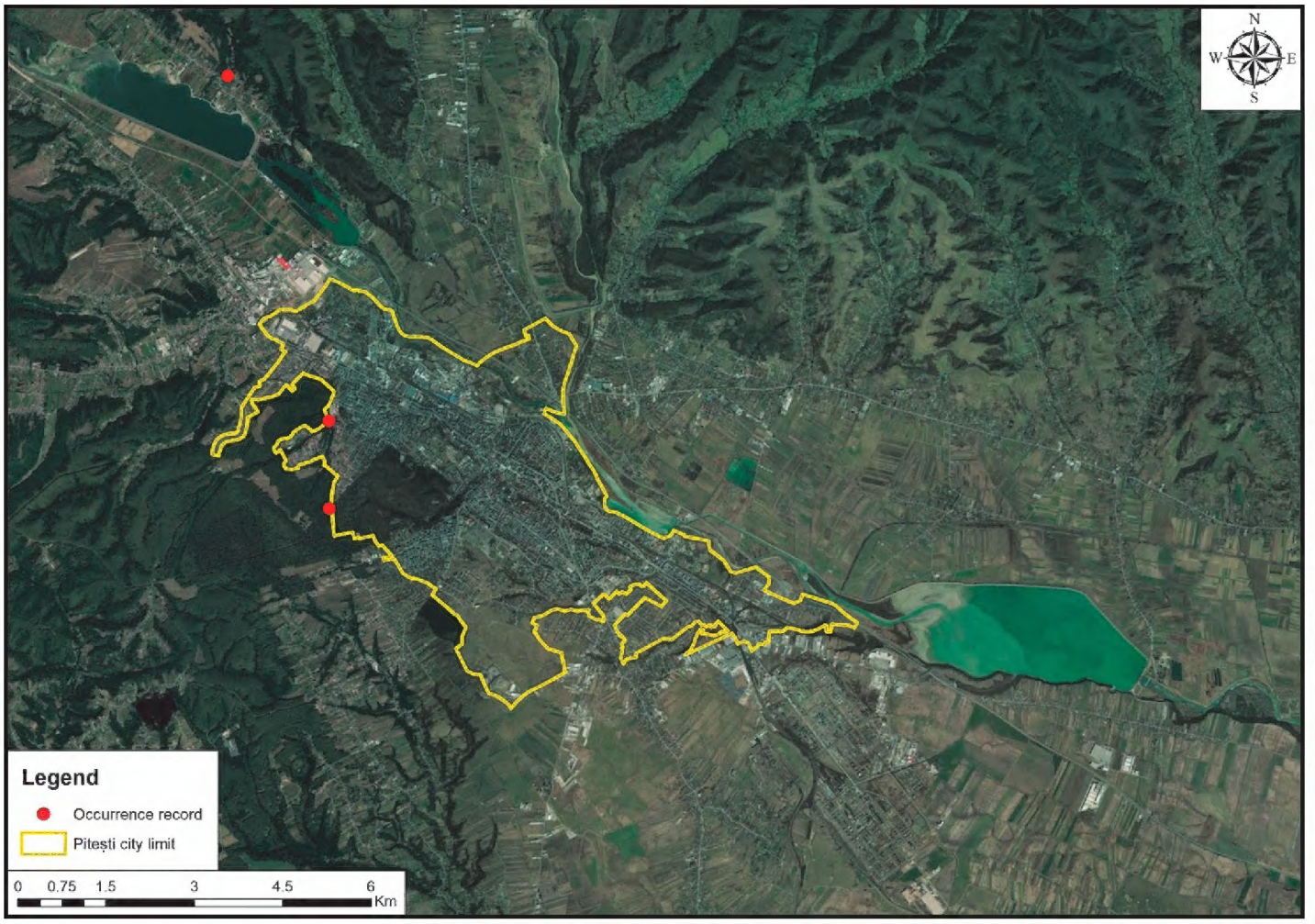

Figure 4. Distribution map of *Lissotriton vulgaris* in the studied area.

Triturus cristatus (Laurenti, 1768)

The great crested newt was found in only two locations. One adult female in the aquatic phase was found is April 2021 in a stream flowing at the edge of the Trivale Forest and another adult was found in early April 2018 dead on the road, run over on the street going through the forest next to a pond where the smooth newt was also present. (Figure 5)

Order Anura
Family Bombinatoridae
Bombina variegata (Linnaeus, 1758)

The yellow-bellied toad was found in many locations in the Trivale Forest in small, usually temporary, ponds and streams. It is an abundant species, very abundant in most temporary water bodies in the woods. Its range was, unsurprisingly, restricted to the forest. All life stages were observed. (Figure 6)

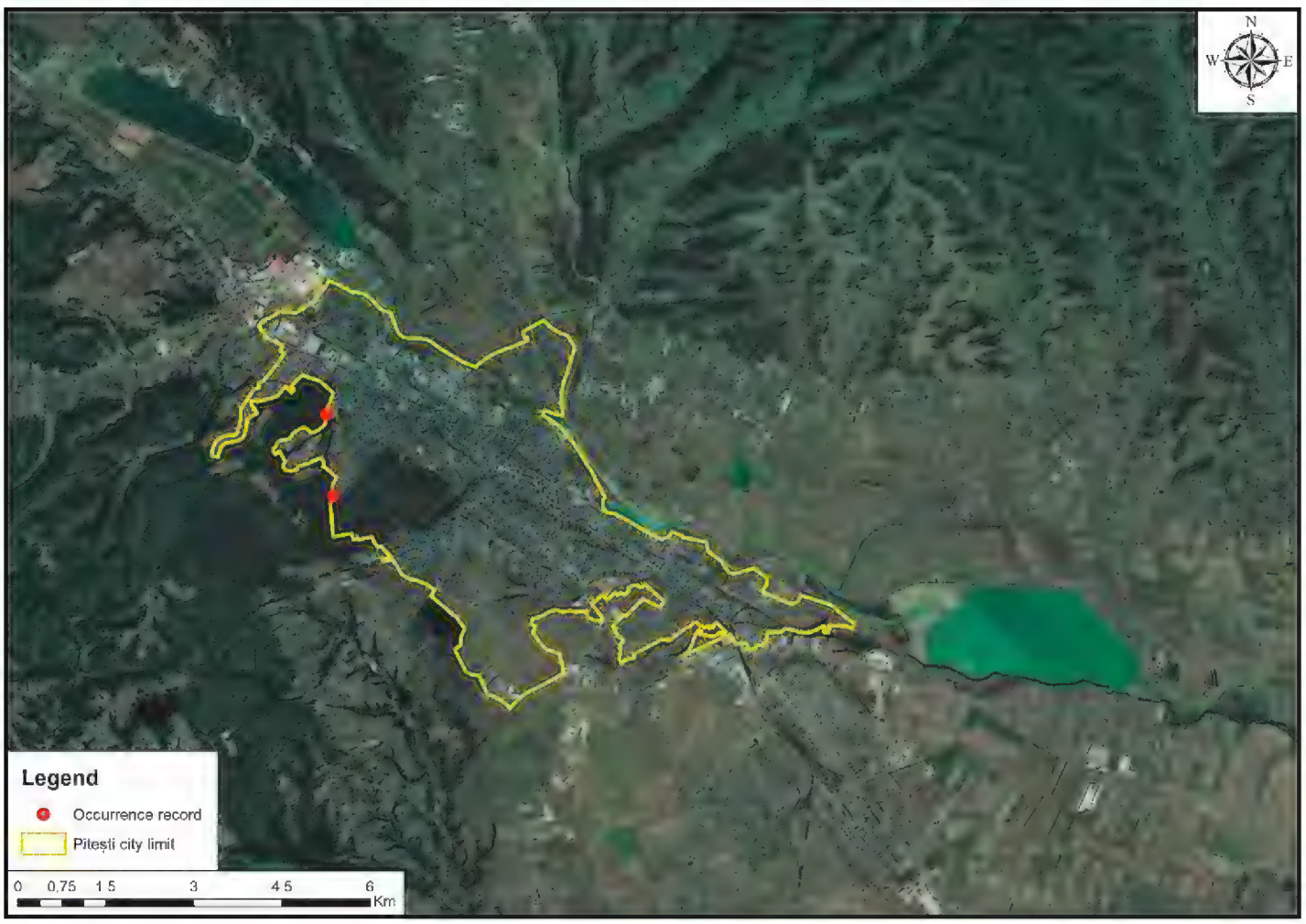

Figure 5. Distribution map of *Triturus cristatus* in the studied area.

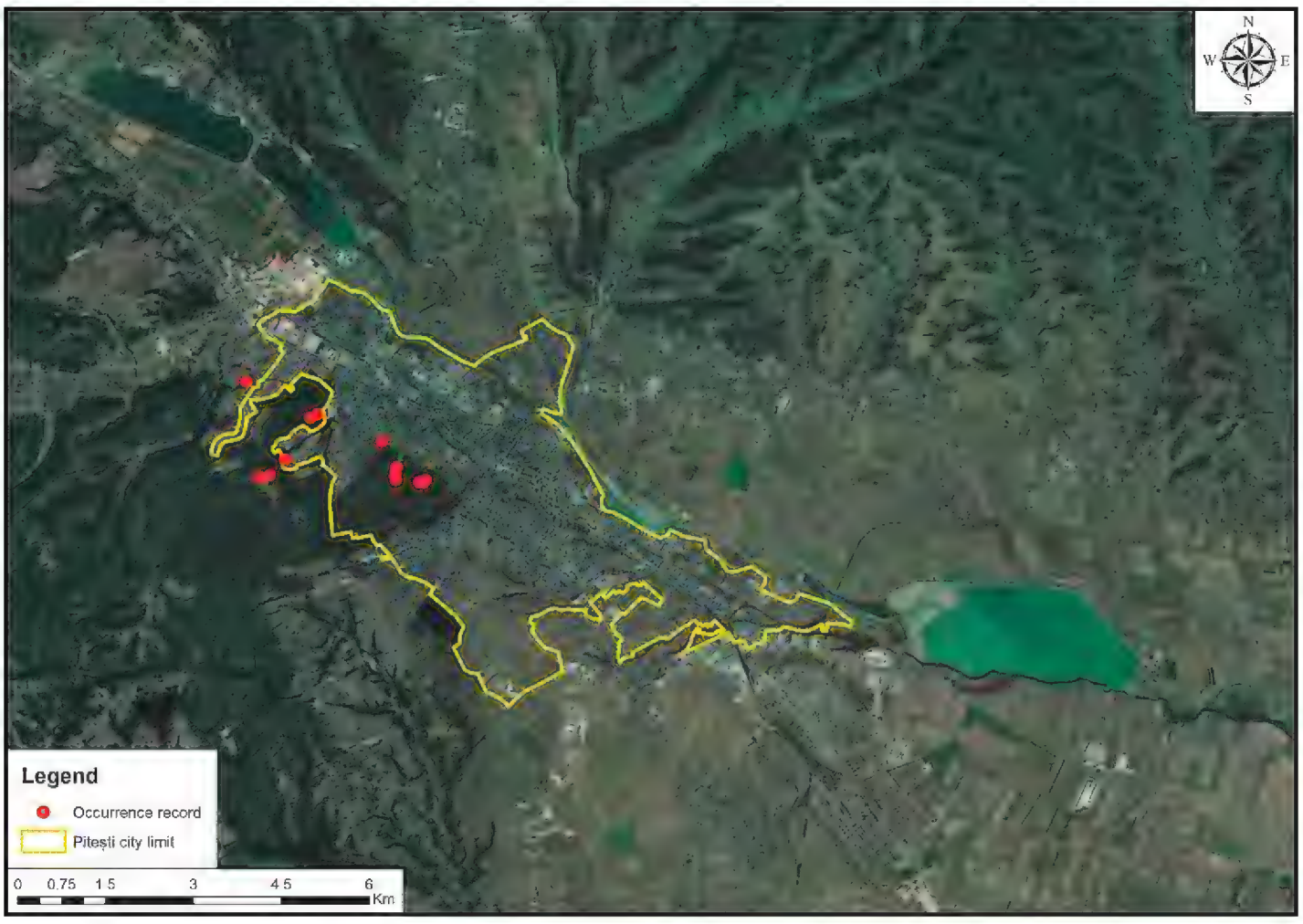

Figure 6. Distribution map of *Bombina variegata* in the studied area.

Family Bufonidae
Bufo bufo (Linnaeus, 1758)

The common toad was mostly recorded in and around the forest, with a few observations in parts of the urban habitat neighbouring the woods, taking shelter in cracks in the concrete. (Figure 7)

Bufotes viridis (Laurenti, 1768)

Although the green toad was also found at the edge of the forest, this amphibian was observed many times in urban and suburban areas, using cracks in the pavement as shelter and coming out to feed at night. A lot of the specimens found were roadkills during the migration towards the breeding spots. (Figure 8)

Family Hylidae
Hyla orientalis Bedriaga, 1890

I managed to find the eastern tree frog in a variety of habitats, the most common one being the forest edge, but it was also recorded in suburban and urban areas and in the reed beds on the banks of the Prundu Lake, on the Argeș River. In July and August 2018 I recorded an interesting breeding site of this species: a pair (or more)

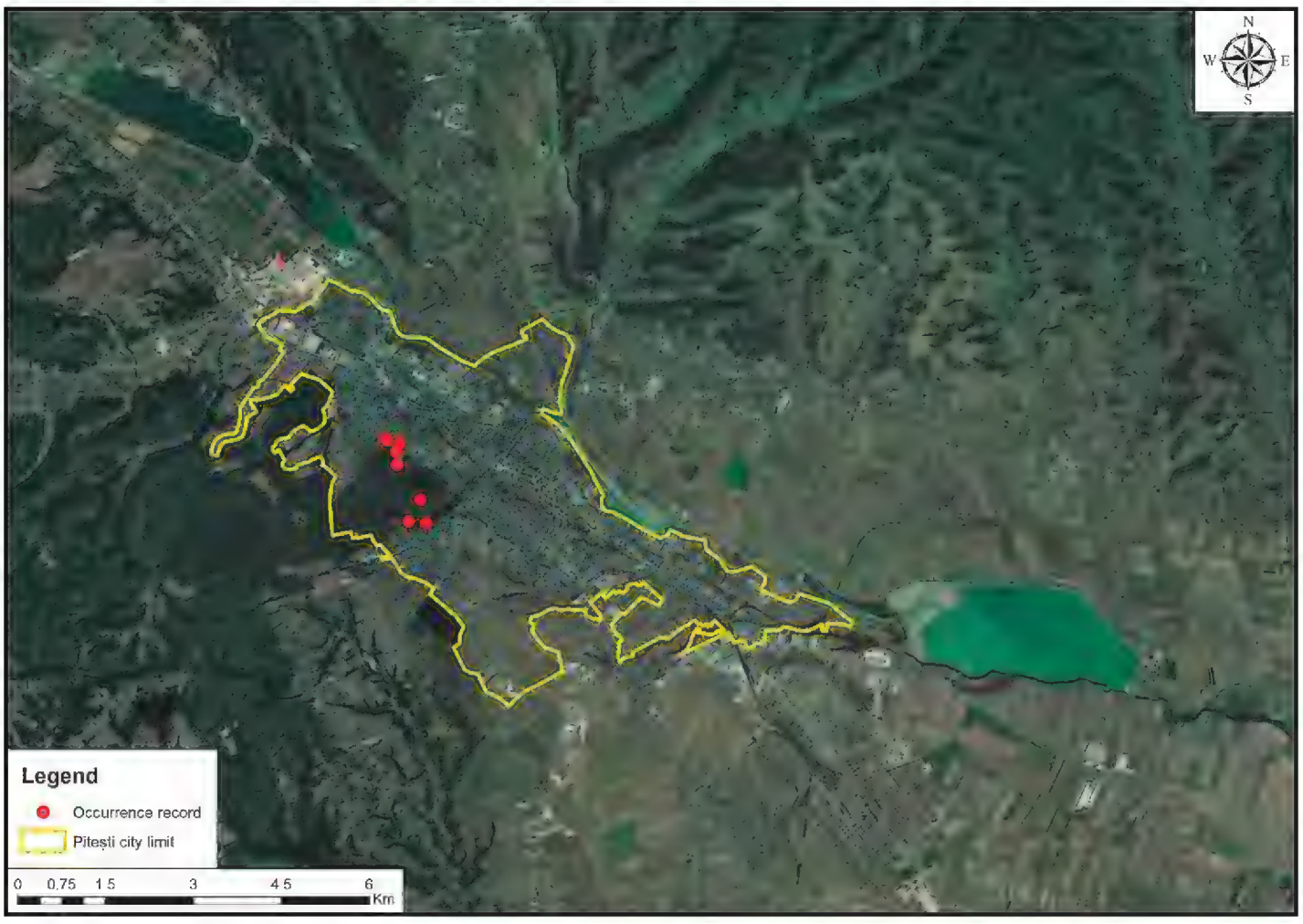

Figure 7. Distribution map of *Bufo bufo* in the studied area.

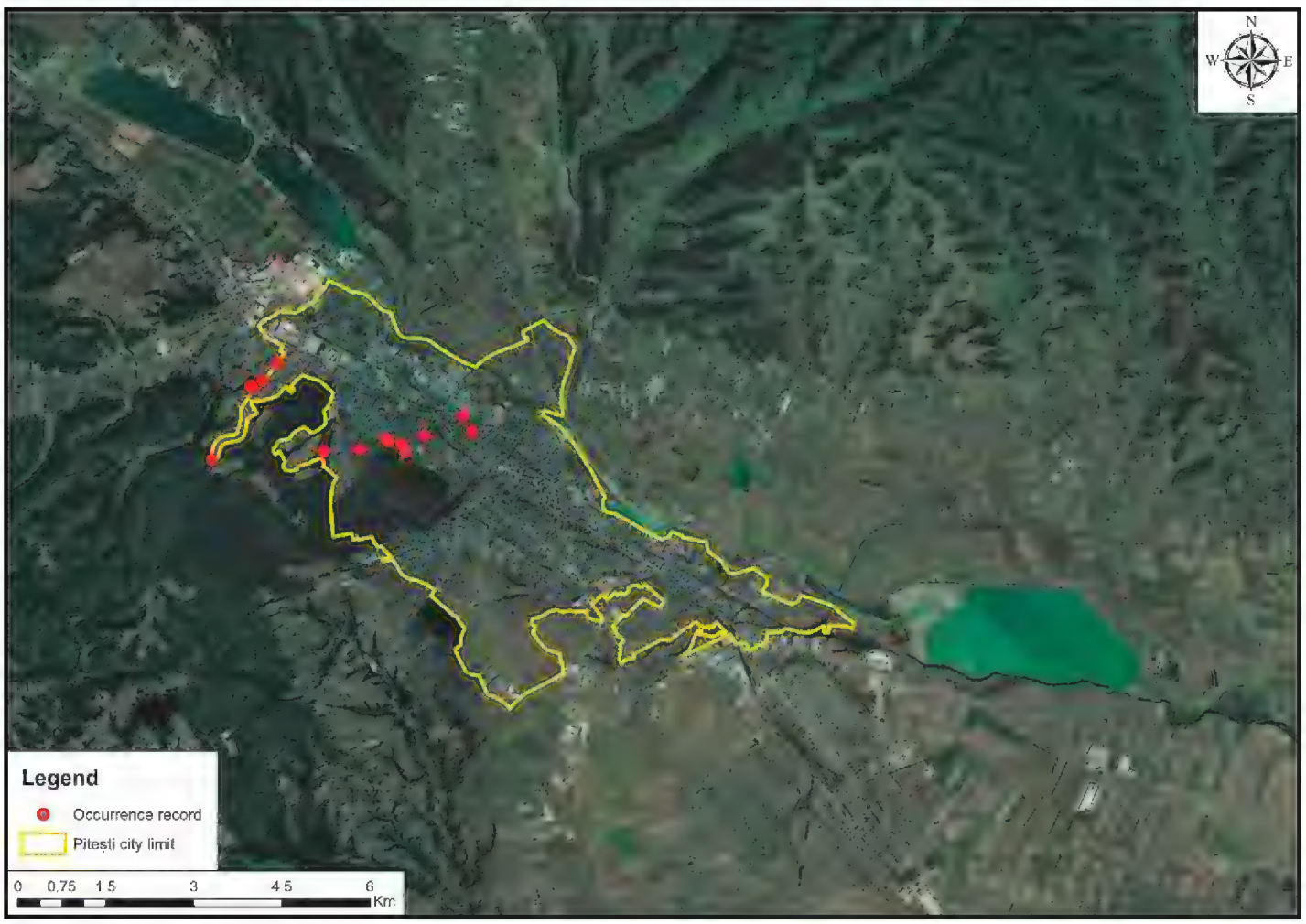

Figure 8. Distribution map of *Bufotes viridis* in the studied area.

of tree frogs spawned in someone's garden in a water barrel used for watering the crops. Although some tadpoles were lost as a result of the water being taken out for irrigation, a fair number of them reached maturity. Because of the nocturnal lifestyle of this amphibian and its cryptic colours, many of the identifications were made by sound. The telling apart of this species from *Hyla arborea* Linnaeus, 1758 was based on the distribution according to Stöck et al. 2012. (Figure 9)

Family Ranidae

Pelophylax sp.

Because of the difficulty of identifying these species without capturing them (Cogălniceanu 2002) and their capture is many times impossible, I treated them as the *Pelophylax* complex. Despite that, out of the two species and one klepton of water frogs in Romania, I managed to identify with certainty the marsh frog (*Pelophylax ridibundus* (Pallas, 1771)). However, it is plausible that there might also be other species present. Further research is needed. I should note that the University of Pitești has in its collection 2 water frogs labeled as "*Rana esculenta*" collected in 1965 in Pitești by Gh. Stănescu, but I have not identified the specimens personally. The water frogs are very common in certain places. They can be found easily in ponds and streams at the edge of the Trivale Forest, but also on the course of the Argeș River and in temporary ponds on its banks. (Figure 10)

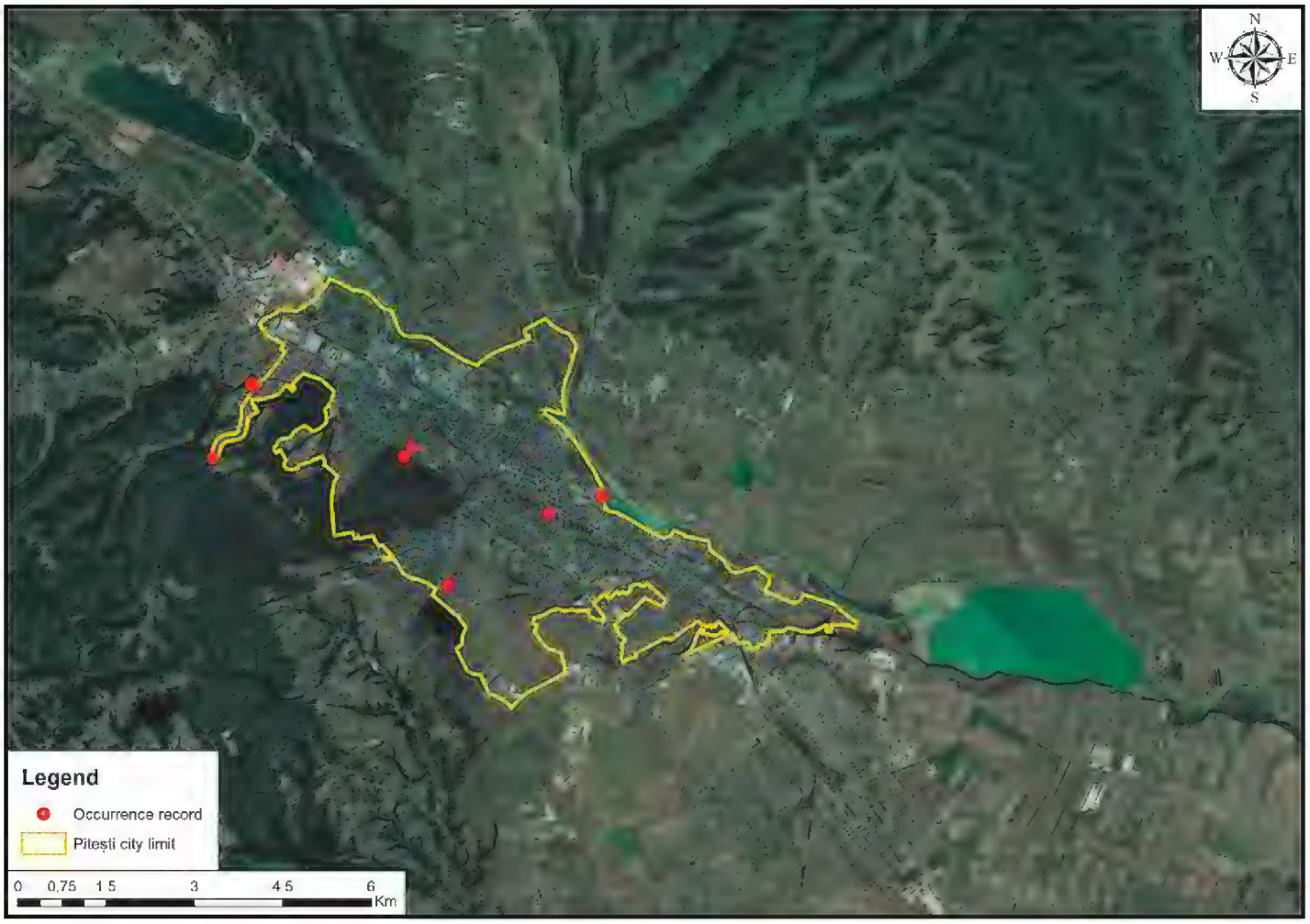

Figure 9. Distribution map of *Hyla orientalis* in the studied area.

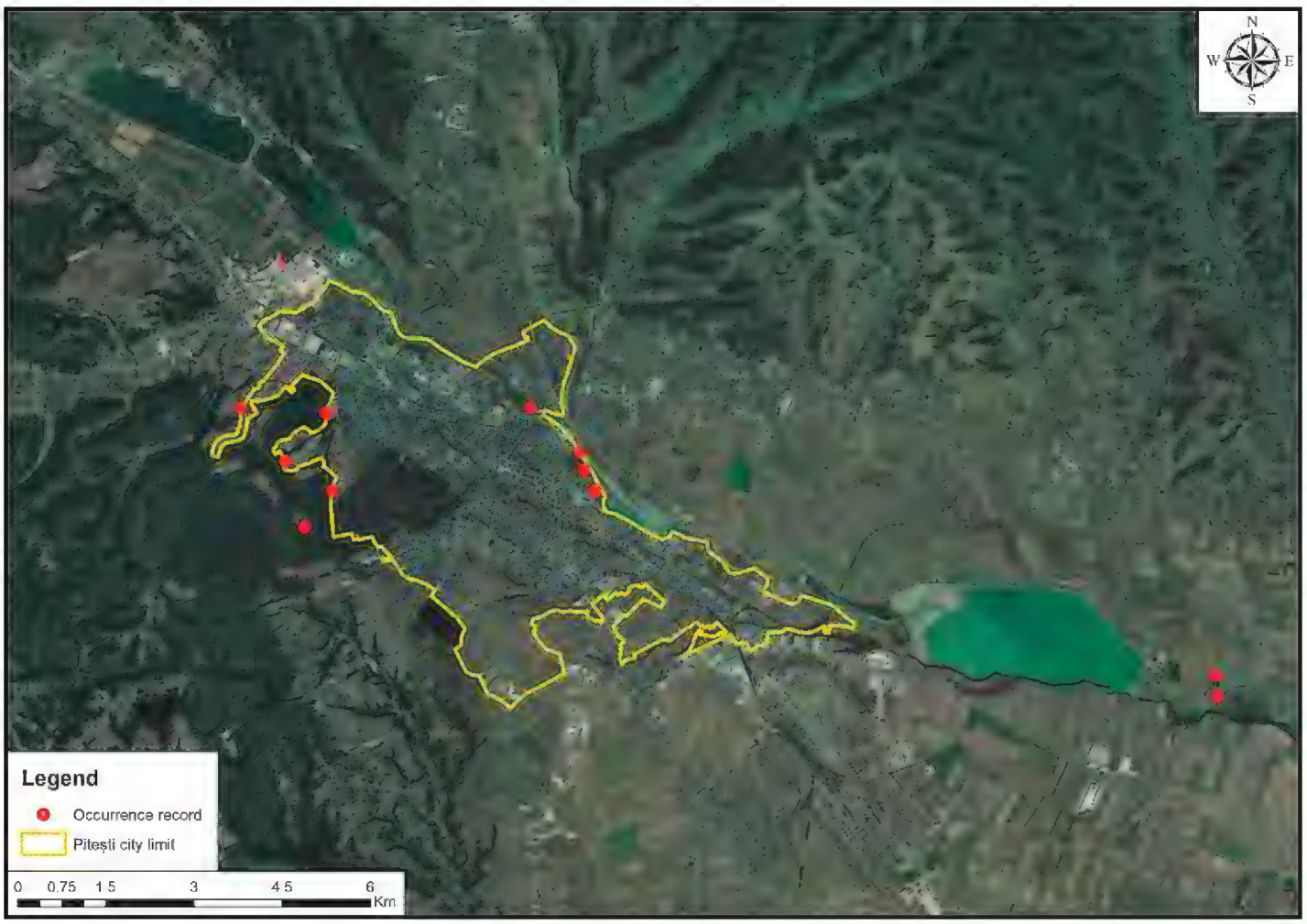

Figure 10. Distribution map of *Pelophylax* in the studied area.

Rana dalmatina Fitzinger in Bonaparte, 1839

The agile frog is an abundant species that was found in many parts of the Trivale Forest. Being a typically woodland animal, it is to be expected to find it mostly in forests and near them, but I have one rather peculiar record of a roadkill individual on the bank of the Argeș River on March 30th 2019, the closest thing to a forest in the area being the Lunca Argeșului Park, which is a pretty well-kept park with planted trees of various species. (Figure 11)

Class Reptilia
Order Testudines
Family Emydidae
Emys orbicularis (Linnaeus, 1758)

The European pond terrapin was found on the Argeș River, including the Prundu Lake and in the Ștrand Park, a city park built on the bank of the Argeș River. One somewhat curious sighting was a juvenile terrapin found in a small pond at the edge of the Trivale Forest, far away from the river. Its presence there could have been caused by a release by some local, but it is also very likely to be a natural occurrence. Inside the city I found a lot of specimens of this species translocated by humans in an

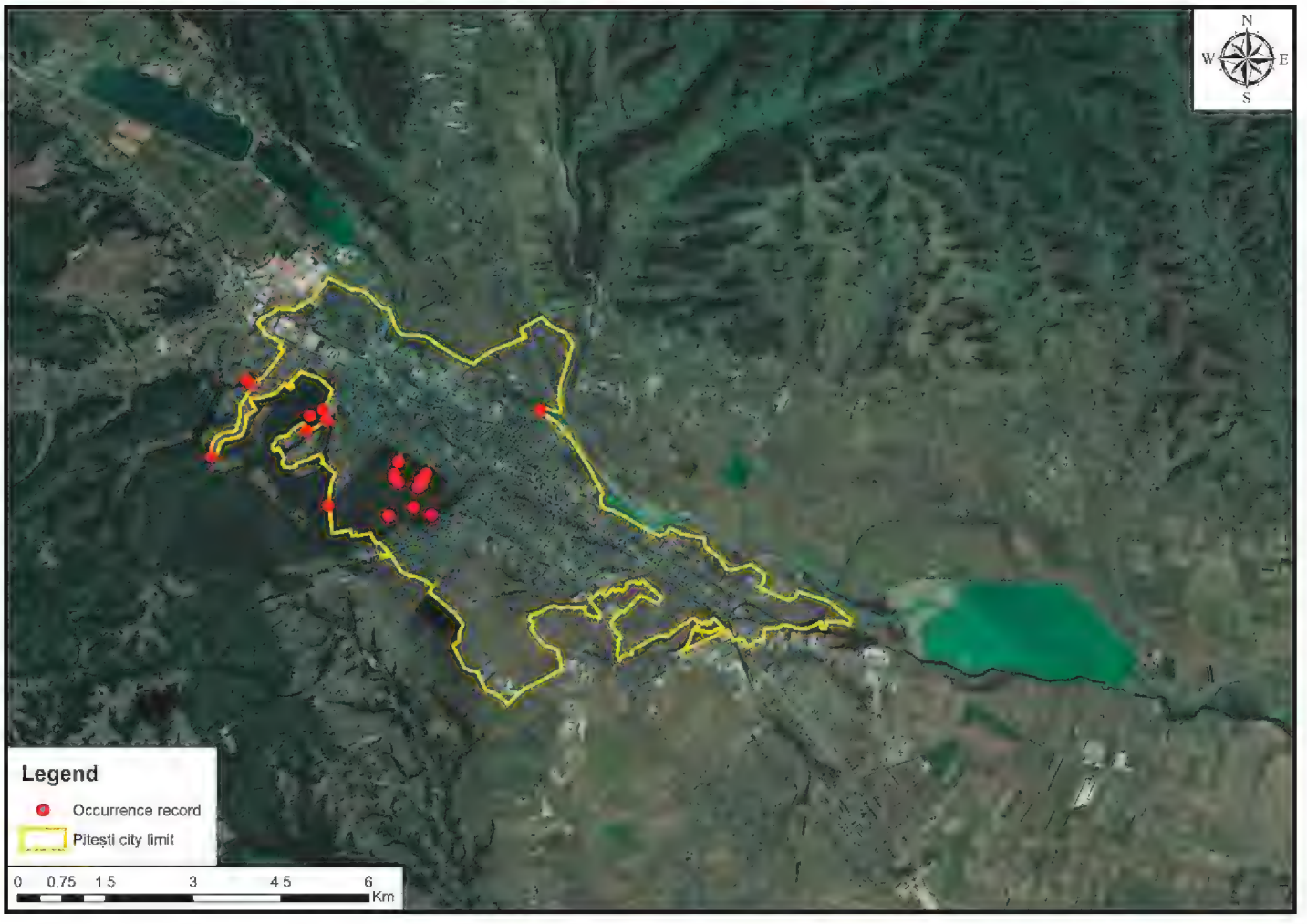

Figure 11. Distribution map of *Rana dalmatina* in the studied area.

artificial pond in a park called Expo Park (located 44.862600, 24.870900). Together with Elena G., a volunteer at the NGO "Wilderness Research and Conservation" we obtained permission from the park's administration to go and capture the native species in order to release them into the wild. On July 31st 2021 there were rescued 36 European pond terrapins. Because of the conditions in the park, some of the terrapins had health problems, such as eye problems due to the water condition, malnutrition (lack of food, their diet was formed in part out of the junk food thrown by visitors in water) (Rangel-Mendoza et al. 2014) and wounds on the legs and plastron, possibly caused by the rough materials (concrete) that were the only available surfaces to bask on. After the period of rehabilitation, they were released into natural habitats. Due to the anthropic origin of those specimens and their subsequent release into a natural waterway, I decided not to include the location on the map. (Figure 12)

Trachemys scripta (Thunbegr in Schoepff, 1792)

The pond slider is an American species of turtle that used to be very popular in the pet trade. It originates from Southwestern USA and for many years it was sold in many petstores for fairly small prices. Unfortunately, people buy these cheap animals and, as they grow, realize they cannot take care of them anymore, resulting in their abandonment. It is listed as one of the species on the European list of invasive species

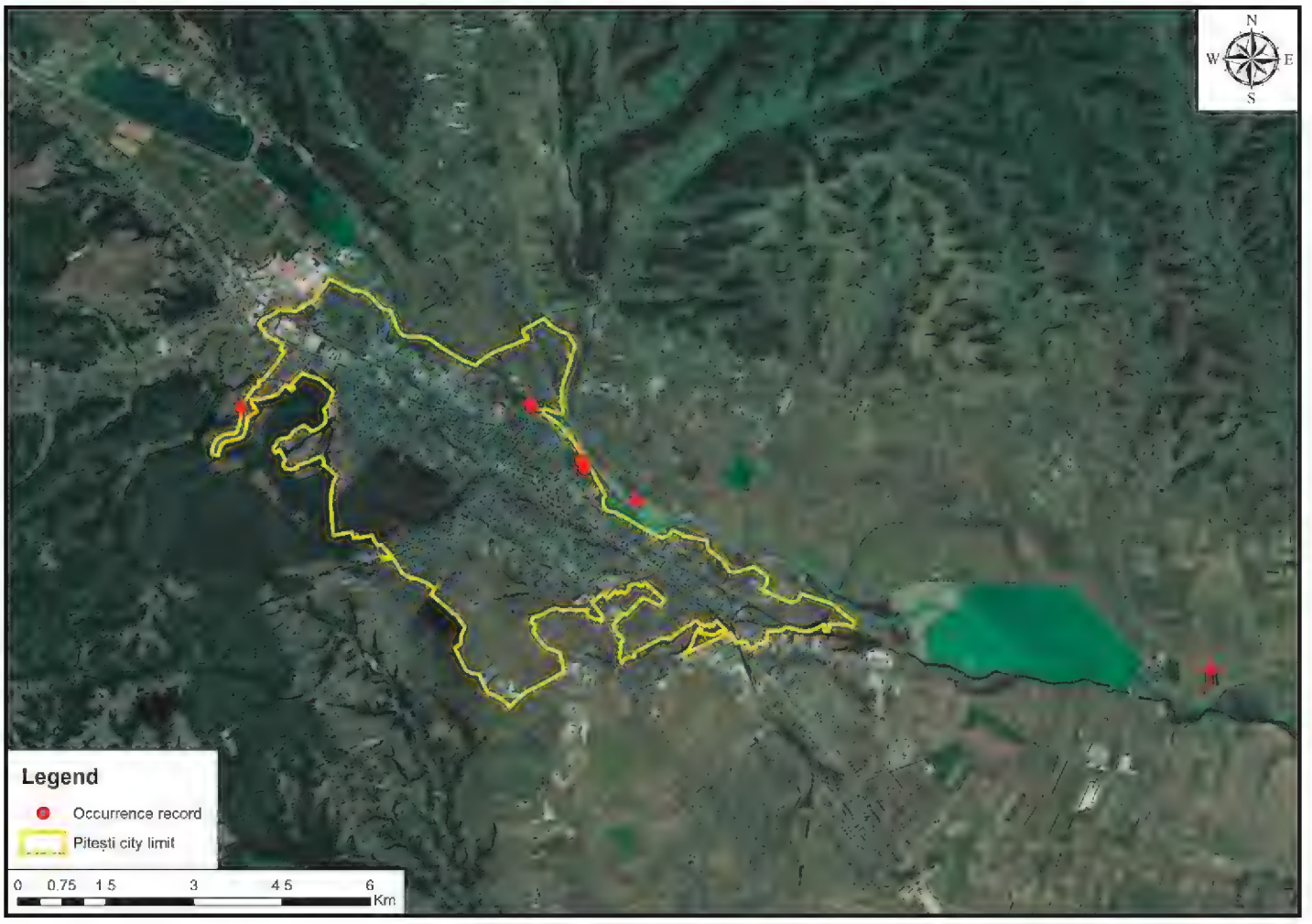

Figure 12. Distribution map of *Emys orbicularis* in the studied area.

(https://www.invazive.ccmesi.ro/). Many exotic turtles, especially pond sliders, were dumped in the artificial park mentioned previously, but some have been released right in the Argeș River and in the Ștrand Park, from where more Sliders can find their way into the natural water flow. I have observed two subspecies of pond sliders: the red-eared slider (*Trachemys scripta elegans* Wied-Neuwied 1838) and the yellow-bellied slider (*Trachemys scripta scripta* Thunberg in Schoepff 1792). In the habitats where both *Trachemys scripta* and *Emys orbicularis* are present, the exotic species may compete with the native species for the basking spots (Polo-Cavia et al. 2015). Being a bigger species that can also carry dangerous disease for our native turtles, they have the potential to cause harm (Cadi and Joly 2004; Meyer et al. 2015; Iglesias et al. 2015). Even more so as the river grants them acces to disperse into more natural habitats. (Figure 13)

Order Squamata
Family Lacertidae
Lacerta agilis Linnaeus, 1758

I only observed the sand lizard in one area, and that is the Ștrand Park, located on the bank of the Argeș River. A somewhat scarce lizard, compared to the other species

Figure 13. Distribution map of *Trachemys scripta* in the studied area.

that I identified, it was found predominantly in the bushy part of the park, sharing the habitat with wall lizards and eastern green lizards. (Figure 14)

Lacerta viridis (Laurenti, 1768)

The eastern green lizard was more frequently observed than its relative, the sand lizard. I identified this species in numerous spots such as inside the Trivale Forest and at its edges, the banks of the Argeș River, as well as inside the city, around the vegetation between apartament blocks. (Figure 15)

Podarcis muralis (Laurenti, 1768)

Without a doubt, the common wall lizard was the most numerous species of reptile that I managed to observe. On October 7th 2018 I was able to count around 94 individuals in one outing, in the course of 1h30min. It was identified in a few places that can, more or less, be connected by following the railway. There are a few spots far from the said railway, but tracing back, they all seem to be "sprouting" from there. This is why I theorize that the population of wall lizards in Pitești has expanded all the way using trains and the railway (Hedeen and Hedeen 1999; Covaciu-Marcov et al. 2006; Gherghel et al. 2009; Gherghel and Tedrow 2019). The man-made

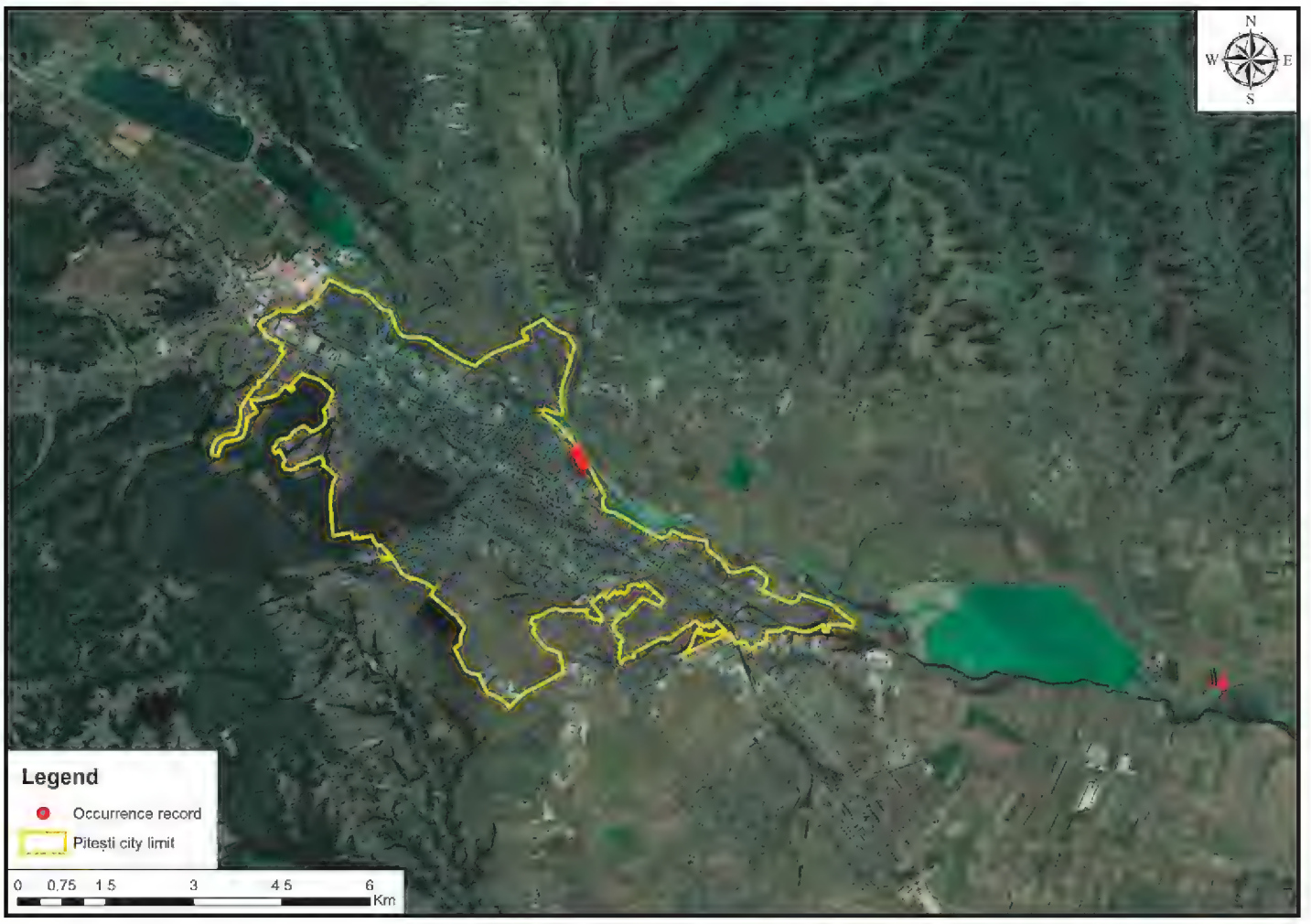

Figure 14. Distribution map of *Lacerta agilis* in the studied area.

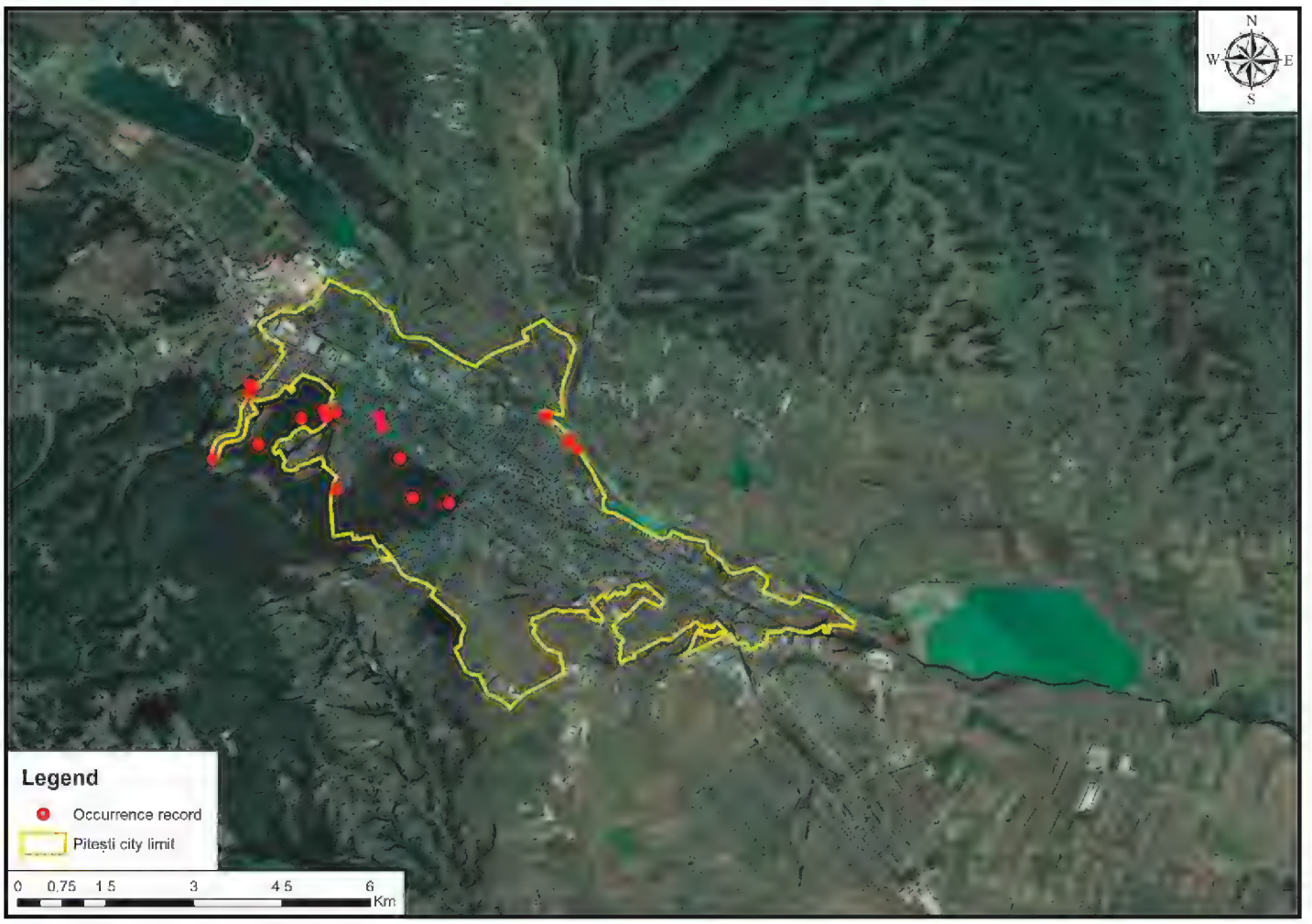

Figure 15. Distribution map of *Lacerta viridis* in the studied area.

habitats are perfect for this species: it was very numerous in places like abandoned train wagons, previously mentioned railways, concrete walls and so on. It must be mentioned that there were observed some individuals that resembled very much the Italian subspecies: *Podarcis muralis nigriventris* (Bonaparte, 1838) but their capture was impossible and so we cannot talk about a 100% accurate identification. If indeed we are talking about the *nigriventris* subspecies, this could be a result of accidental introduction (Michaelides et al. 2015). More research is needed on this aspect of alien herpetofauna (Damas-Moreira et al. 2020). (Figure 16)

Family Anguidae

Anguis colchica (Nordmann, 1840)

The eastern slow worm was only found in two areas of the Trivale Forest. It is of no surprise, as this is a woodland animal. One of them might have been predated and another three were found as roadkill, as they were recorded either on the road or on a path in the forest frequented by joggers and dog walkers. Only one living individual was observed. (Figure 17)

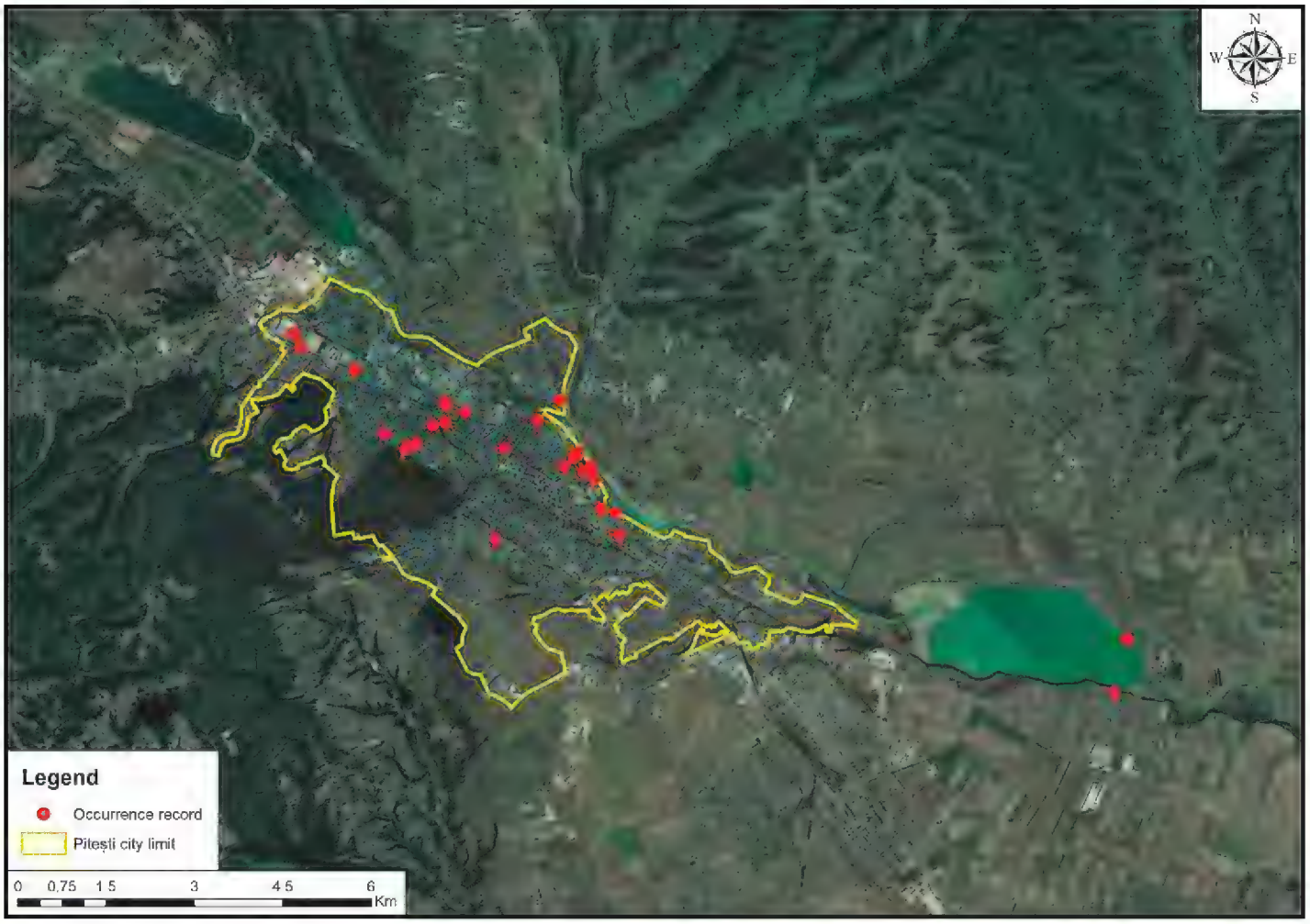

Figure 16. Distribution map of *Podarcis muralis* in the studied area.

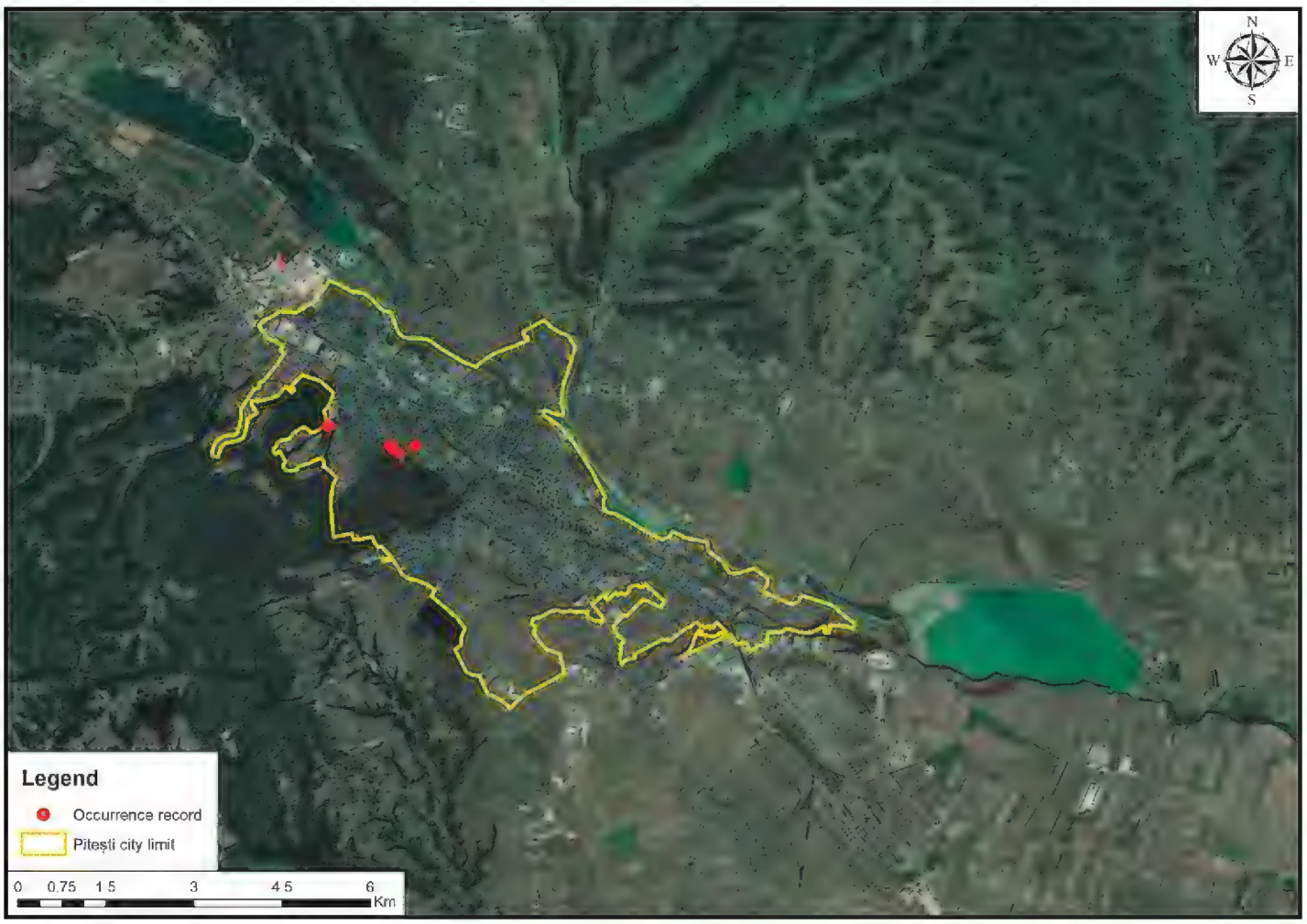

Figure 17. Distribution map of *Anguis colchica* in the studied area.

Family Colubridae
Coronella austriaca Laurenti, 1768

The smooth snake has proven fairly cryptic. It was identified in several places, mostly in and around the Trivale Forest, but there is also a record sent in by a local who filmed one in their garden, far from the rest of the records, but still somewhat close to a small tree-covered area. (Figure 18)

Family Natricidae
Natrix natrix (Linnaeus, 1758)

The grass snake is the most common species of snake in the area the study was conducted. Being a reptile that dwells in wet places and feeds mostly on amphibians, it should be of no surprise that it was observed on the banks of the Argeș River, in parks with ponds and channels, around temporary water bodies with *Bombina variegata* in the forest and small ponds in rural areas. (Figure 19)

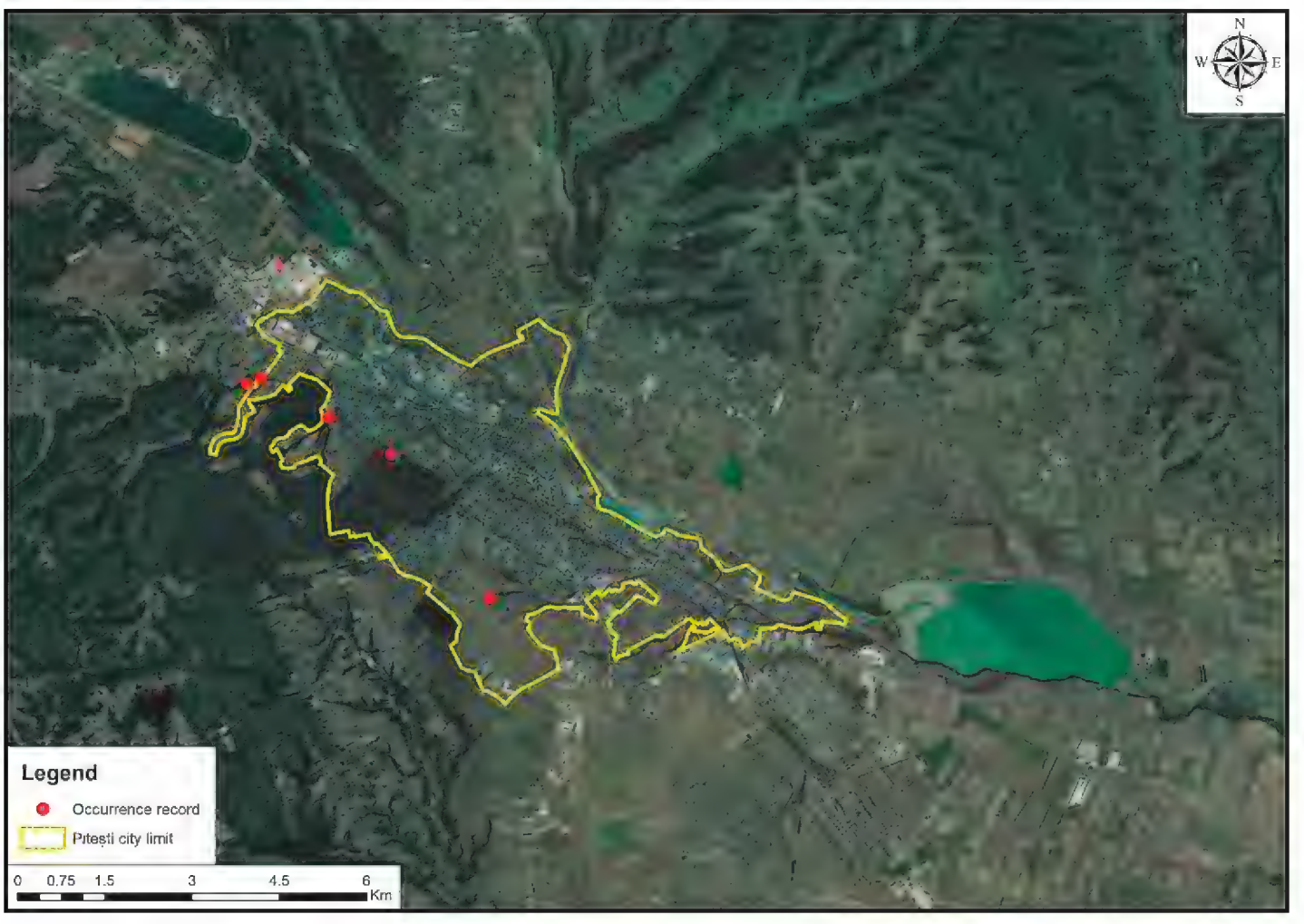

Figure 18. Distribution map of *Coronella austriaca* in the studied area.

Figure 19. Distribution map of *Natrix natrix* in the studied area.

Natrix tessellata (Laurenti, 1768)

The records of dice snakes in Argeș County are very rare (Conete D., pers. communication), this presented here being, to my knowledge, the first published record in the county. I was not the finder, instead I got this observation from a post on social media made by a local. The spot where this snake was found is inside the Ștrand Park in late October 2019. Its habitat is most likely the cemented banks of the Argeș River. The follow-up of the Dice Snake that was photographed by the aformentioned local is unknown. Nonetheless, it is an important information regarding the distribution of the species in the county and, to my knowledge, this represents the first published record of *Natrix tessellata* in Argeș county. (Figure 20)

Family Viperidae

Vipera berus (Linnaeus, 1758)

There have been unverified reports of adders -*Vipera berus* (Linnaeus, 1758) by the locals, as well as possible snakebite cases in dogs. This, together with the fact that the species was confirmed in locations surrounding Pitești (just a few kilometers from the studied area) and some of the habitats visited matches pretty well the habitat of this species, makes me believe that the existence of a population is probable, even

Figure 20. Distribution map of *Natrix tessellata* in the studied area.

though no individual was observed during the survey. For this reason, the species is not included in the list of identified species of herpetofauna.

Conservation

The expansion of the urban and suburban areas. One of the most important threat to wild reptiles and amphibians is habitat loss (Brewster et al. 2018). In the last years a lot of new houses have been built in the meadows surrounding the woodland, and parts of the forest have been cleared for the same purpose. This puts at risk species such as *Triturus cristatus*, *Lissotriton vulgaris*, *Salamandra salamandra*, *Bombina variegata*, *Coronella austriaca*, *Natrix natrix* and *Anguis colchica* mainly due to the habitat loss (Brewster et al. 2018).

Illegal collecting for the pet trade. Many species are put at risk because of illegal collecting and faulty exploitation (Altherr and Lameter 2020). The most popular species of herpetofauna that is being captured illegally from the wild is *Emys orbicularis* (Mărginean et al. 2018), but there was one instance of people being observed capturing and taking home *Podarcis muralis* individuals. The *Emys*

orbicularis found in the Expo Park are a prime example of their popularity when it comes to being taken home as pets by people.

Heavy traffic. Each year, a significant number of reptiles and amphibians fall victim to cars on the roads going through their habitat (Fahrig et al. 1995; Colino-Rabanal and Lizana 2012), especially during the breeding migration of amphibians. Some species that have been observed as roadkill more numerously are *Bufotes viridis, Bufo bufo, Anguis colchica* and *Natrix natrix* (although the latter might have also included instances of deliberate killing).

Deliberate killing by locals. Many reptiles and amphibians are killed by locals due to myths, misbeliefs, fear or ignorance (Fuhn 1969, Marshall et al. 2020). The most common victims are species of snakes, but also *Anguis colchica* due to the confusion of this species with a snake (Fuhn 1969) and even *Lacerta viridis* (pers. observation). There is a long road to go until people finally understand the importance of these animals, but it is possible with education.

Invasive species. The impact of a newly introduced species in an ecosystem on the native species can be huge, at times leading to extinction (Clavero and Garcia-Berthou 2005). Some examples of alien species that have the potential to have an impact on the local herpetofauna are *Trachemys scripta* (which's effect has been discussed earlier) and *Felis catus* (Woods et al. 2003, Loss et al. 2013) which has been observed preying on *Rana dalmatina, Lacerta viridis* and *Natrix natrix* (pers. observation). Measures are advised to be taken in order to limit the spreading of this invasive species, such as fining more harshly the abandonment of pets, supporting and facilitating the capturing of invasive species and setting up centers to take sliders into their custody.

Out of all the 18 species recorded in the study area, 13 are included in The Red Book of Romanian Vertebrates, 17 in the Berne Convention on the Conservation of European Wildlife and Natural Habitats and in 16 in Order 57/2007 issued by the Government of Romania and one on the list of invasive alien species of European Union concern (Table 4).

It should be noted that at the time the Convention took place and the law and the book were written, *Hyla orientalis* was part of *Hyla arborea* (Stöck et al. 2012), *Pelophylax ridibundus* was *Rana ridibunda* (Dubois and Ohler 1994), *Bufotes viridis* was *Bufo viridis (*Dufrenses et al. 2019), *Lissotriton vulgaris* was named *Triturus vulgaris* (Titus and Larson 1995) and *Anguis colchica* belonged to *Anguis fragilis* (Gvozdík et al. 2010). I used the updated taxonomy based on the new genetic-based studies in this paper and placed the protection status accordingly.

Table 4. Status of protection of the species of amphibians and reptiles recorded

Species	Berne Convention on the Conservation of European Wildlife and Natural Habitats	Order 57/2007	The Red Book of Romanian Vertebrates	The IUCN Red List of Threatened Species
Salamandra salamandra	Berne III	Order 57/2007 annex 4B	VU	LC
Lissotriton vulgaris	Berne III	Order 57/2007 annex 4B	NT	LC
Triturus cristatus	Berne II	Order 57/2007 annex 3 & 4A	VU	LC
Bombina variegata	Berne II	Order 57/2007 annex 3 & 4A	NT	LC
Bufo bufo	Berne III	Order 57/2007 annex 4B	NT	LC
Bufotes viridis	Berne II	Order 57/2007 annex 4A	NT	LC
Hyla orientalis	Berne II	Order 57/2007 annex 4A	VU	LC
Pelophylax ridibundus	Berne III	Order 57/2007 annex 5A		LC
Rana dalmatina	Berne II	Order 57/2007 annex 4A	VU	LC
Emys orbicularis	Berne II	Order 57/2007 annex 3 & 4A	VU	NT
*Trachemys scripta**				LC
Lacerta agilis	Berne II	Order 57/2007 annex 4A		LC
Lacerta viridis	Berne II	Order 57/2007 annex 4A		LC
Podarcis muralis	Berne II	Order 57/2007 annex 4B	VU	LC
Anguis colchica	Berne III	Order 57/2007 annex 3B	VU	LC
Coronella austriaca	Berne II	Order 57/2007 annex 4A	VU	LC
Natrix natrix	Berne III			LC
Natrix tessellata	Berne II	Order 57/2007 annex 4A	NT	LC

*List of invasive alien species of European Union concern

Conclusions

In the city of Pitești and the area immediately neighboring I have recorded nine species of amphibians, belonging to five families and two orders, making up 47.36% of the species in the Romanian amphibian fauna (Fuhn 1960; Stöck et al. 2012), as well as nine species of reptiles belonging to five families, three clades and two orders, the eight native reptiles making up 33.33% of the species in the Romanian reptile fauna (Fuhn and Vancea 1961). Apart from better defining the known range of already aknowledged species of the area, the study also brought more light to the expansion of allochthonous reptiles like *Trachemys scripta.* Overall, the paper hereby present fills a few gaps in our knowledge about the fauna of Argeș County, even if a few more situations remain to be researched further.

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